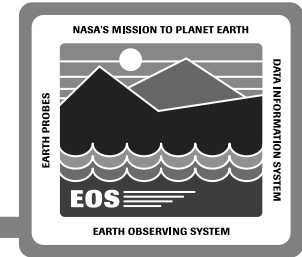


Risk Management

George Percivall

System Design Review - 29 June 1994

Objectives and Agenda



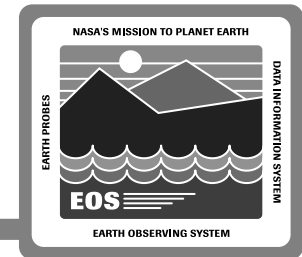
Objectives

- Summarize Significant Risks
- Identify Key Decisions related to Risks
- Present integrated mitigation plan in support of decisions

Agenda

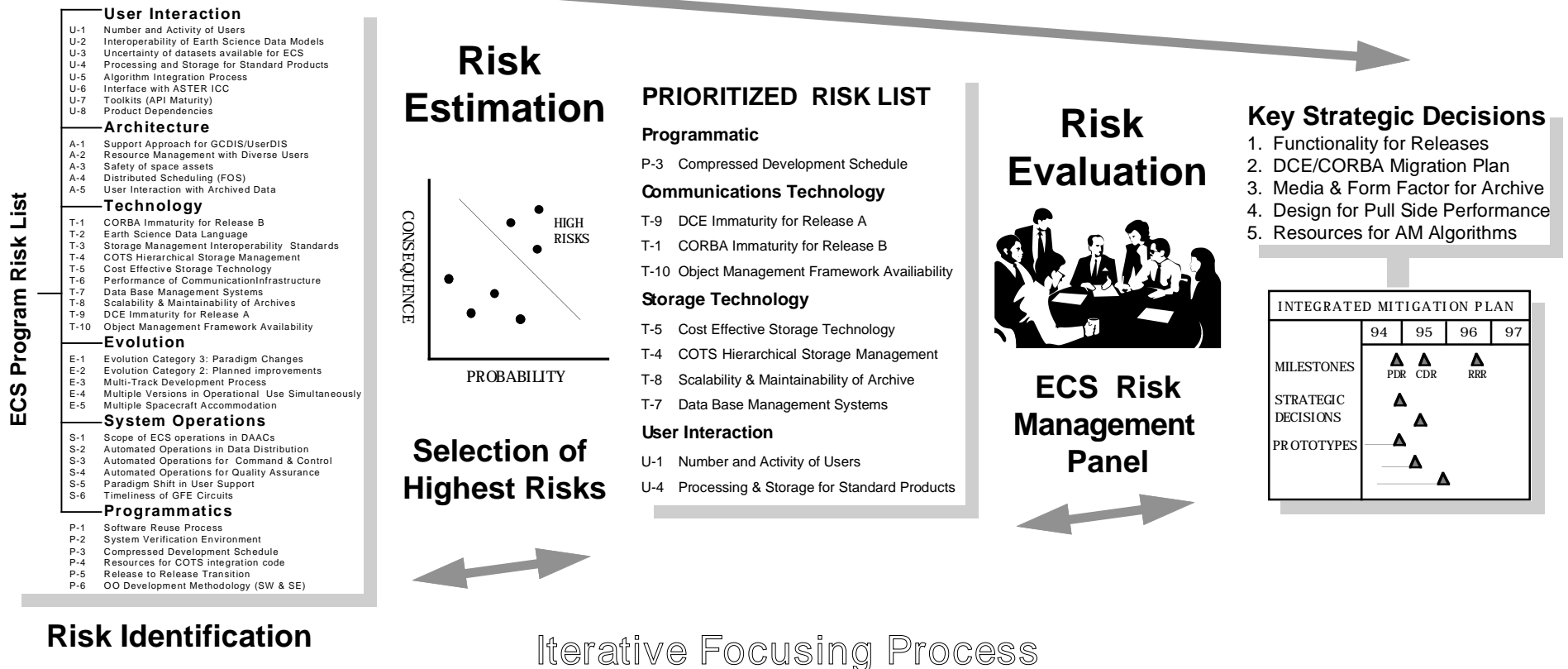
- ECS Program Risk Management
- Program Risks
 - Programmatic
 - Communications Technology
 - Storage Technology
 - User Interaction
- Key Strategic Decisions
- Integrated Risk Mitigation Plan

ECS Program Risk Management

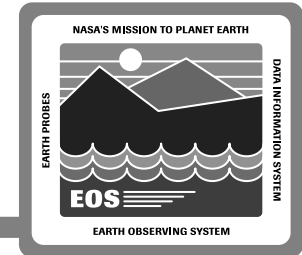


Attention to Detail

Strategic Perspective



ECS Prioritized Risk List



Programmatic

P-3 Compressed Development Schedule

Communications Technology

T-9 DCE Immaturity for Release A

T-1 CORBA Immaturity for Release B

T-10 Object Management Framework Availability

Storage Technology

T-5 Cost Effective Storage Technology

T-4 COTS Hierarchical Storage Management

T-8 Scalability & Maintainability of Archive

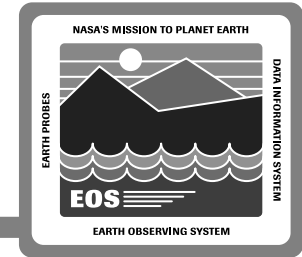
T-7 Data Base Management Systems

User Interaction

U-1 Number and Activity of Users

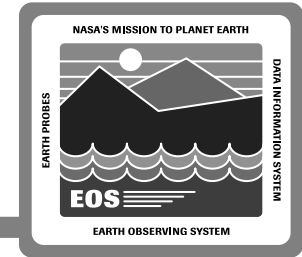
U-4 Processing & Storage for Standard Products

ECS Program Risks: Programmatic



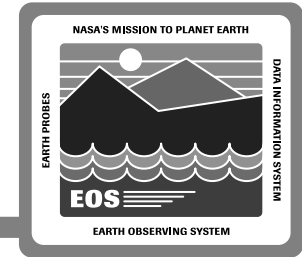
	Risk Item Summary	Major ECS Mitigation Activities
P-3	Compressed Development Schedule <ul style="list-style-type: none">- Compressed development may require excessive peak manpower to achieve assigned functionality for release (See <i>Release Management</i> - R. Barbieri)	<ul style="list-style-type: none">• LOC Estimates by Release• Dynamic Management Modeling Study• Hiring and Training Plan• Define Build/Threads for Releases and IR-1• Maximize Incremental Development Track Activities

ECS Program Risks: Communications Technology



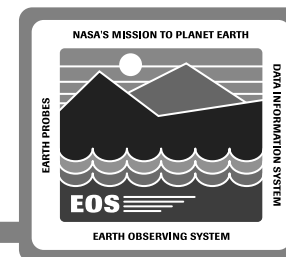
	Risk Item Summary	Major ECS Mitigation Activities
T-9	DCE Immaturity for Release A <ul style="list-style-type: none"> - Performance as usage is scaled up, e.g. over ATM - Breath of supporting products may limit implementation choices e.g. processors, applications, toolkits <i>(see CSMS Summary - E. Lerner)</i>	<ul style="list-style-type: none"> • DCE Prototyping • EP Implementation of DCE • DCE Migration and Product Surveys
T-1	CORBA Immaturity for Release B <ul style="list-style-type: none"> - Delay of CORBA 2.0 ORBs or object services requires partial redesign of SDPS Interoperability and/or CSMS Communications Subsystems <i>(see CSMS Summary - E. Lerner)</i>	<ul style="list-style-type: none"> • ORB Prototyping • DCE Encapsulation in CORBA APIs • EOSDIS Prototype • Infrastructure Prototype • ORB Product Survey • OMG Membership (pending)
T-10	Object Management Framework <ul style="list-style-type: none"> - Uncertainty of DME3.0 or its replacement - Unsuitability or delay in CORBA compatible object management framework <i>(see CSMS Summary - E. Lerner)</i>	<ul style="list-style-type: none"> • DME-precursor prototyping • Release A based on de facto Standards • COTS System Management Study • Join Management Integration Consortium

ECS Program Risks: Storage Technology



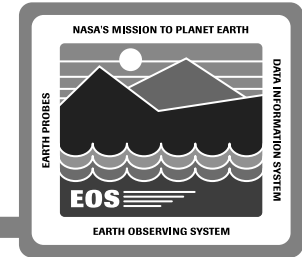
	Risk Item Summary	Major ECS Mitigation Activities
T-5	Cost Effective Storage Technology <ul style="list-style-type: none"> - Meeting allocated floor space, storage cost; given capacity, performance, and RMA requirements (see <i>SDPS Hardware Implementation - Dodge/Huber</i>) 	<ul style="list-style-type: none"> • Storage Technology Insertion Plan • Data Compression Prototype • Network Attached Storage Prototype
T-4	COTS Hierarchical Storage Management <ul style="list-style-type: none"> - COTS storage management systems and distributed file systems reliability and performance. - HSMs could be limiting factor in the system performance (see <i>SDPS Hardware Implementation - Dodge/Huber</i>) 	<ul style="list-style-type: none"> • Design to eliminate HSM as Bottleneck • Multi-FSMS Prototype • Network Attached Storage Prototype
T-8	Scalability & Maintainability of Archive <ul style="list-style-type: none"> - Scalability of current systems - Maintainability of large, long-lived archives - Smaller system approaches not viable for ECS (see <i>SDPS Hardware Implementation - Dodge/Huber</i>) 	<ul style="list-style-type: none"> • Network Attached Storage Prototype • Use Proven Robotics Technology • Pursue Non-Contact Media Technologies (e.g. Serpentine)
T-7	Data Base Management Systems <ul style="list-style-type: none"> - Relational DBMSs may not meet ECS functional and performance requirements for spatial, temporal, coincident search (see <i>SDPS Software Implementation - R. Meyer</i>) 	<ul style="list-style-type: none"> • DBMS Technology Assessment Study • Data Type Services Prototype • Local Information Manager Prototype

ECS Program Risks: User Interaction



	Risk Item Summary	Major ECS Mitigation Activities
U-1	Number and Activity of Users <ul style="list-style-type: none"> - Accurate prediction of usage difficult based on past experience - System usage expected to evolve - Inter-site traffic dependent on data set usage (see <i>Projected System Access and Utilization - P. Thome</i>) 	<ul style="list-style-type: none"> • User/Data Model • Performance Modeling • EOSDIS Prototype • Processing vs. Storage Trade Study • System Design Sensitivity Analysis
U-4	Processing and Storage for Standard Products <ul style="list-style-type: none"> - Growth in science algorithms may exceed available resources of processing and storage. (see <i>SDPS Hardware Implementation - Dodge/Huber</i>) 	<ul style="list-style-type: none"> • Performance Modeling • Scalable System Design: 8x processing and 2x storage of IWG list • Distributed/Parallel Computing Science Algorithm Prototypes • Data Processing Prototype • PGS Toolkit Development & Usage

Key Strategic Decisions



Key Strategic Decisions

2. DCE/CORBA Migration Plan

3. Media/Form Factor for Archive

4. Design for Pull Side Performance

5. Resources for AM Algorithms

PRIORITIZED RISK LIST

Programmatic

P-3 Compressed Development Schedule

Communications Technology

T-9 DCE Immaturity for Release A

T-1 CORBA Immaturity for Release B

T-10 Object Management Framework Availability

Storage Technology

T-5 Cost Effective Storage Technology

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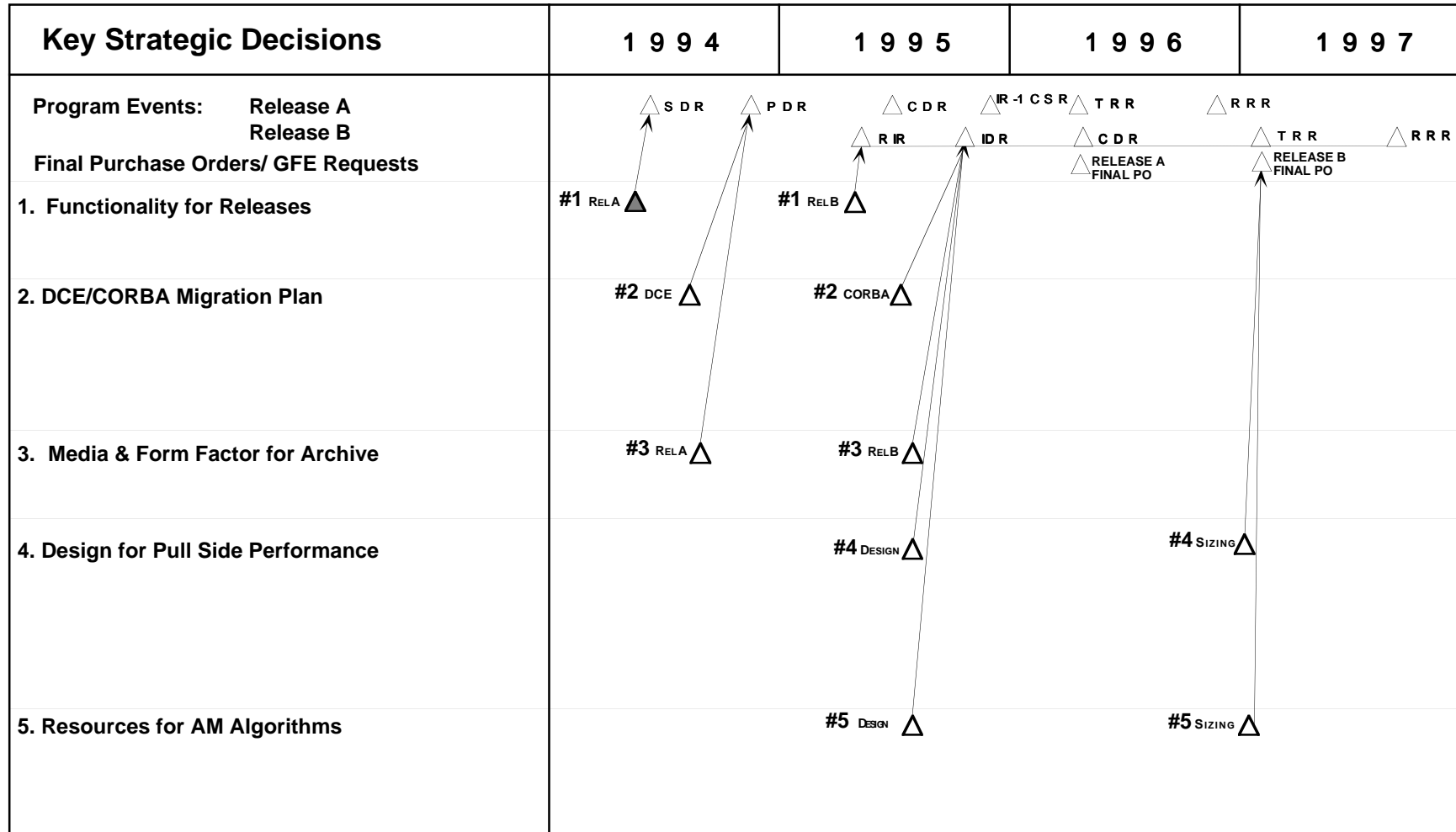
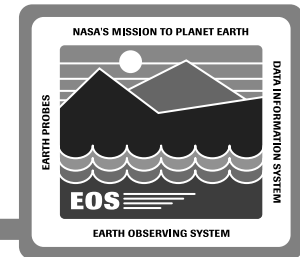
T-7 Data Base Management Systems

User Interaction

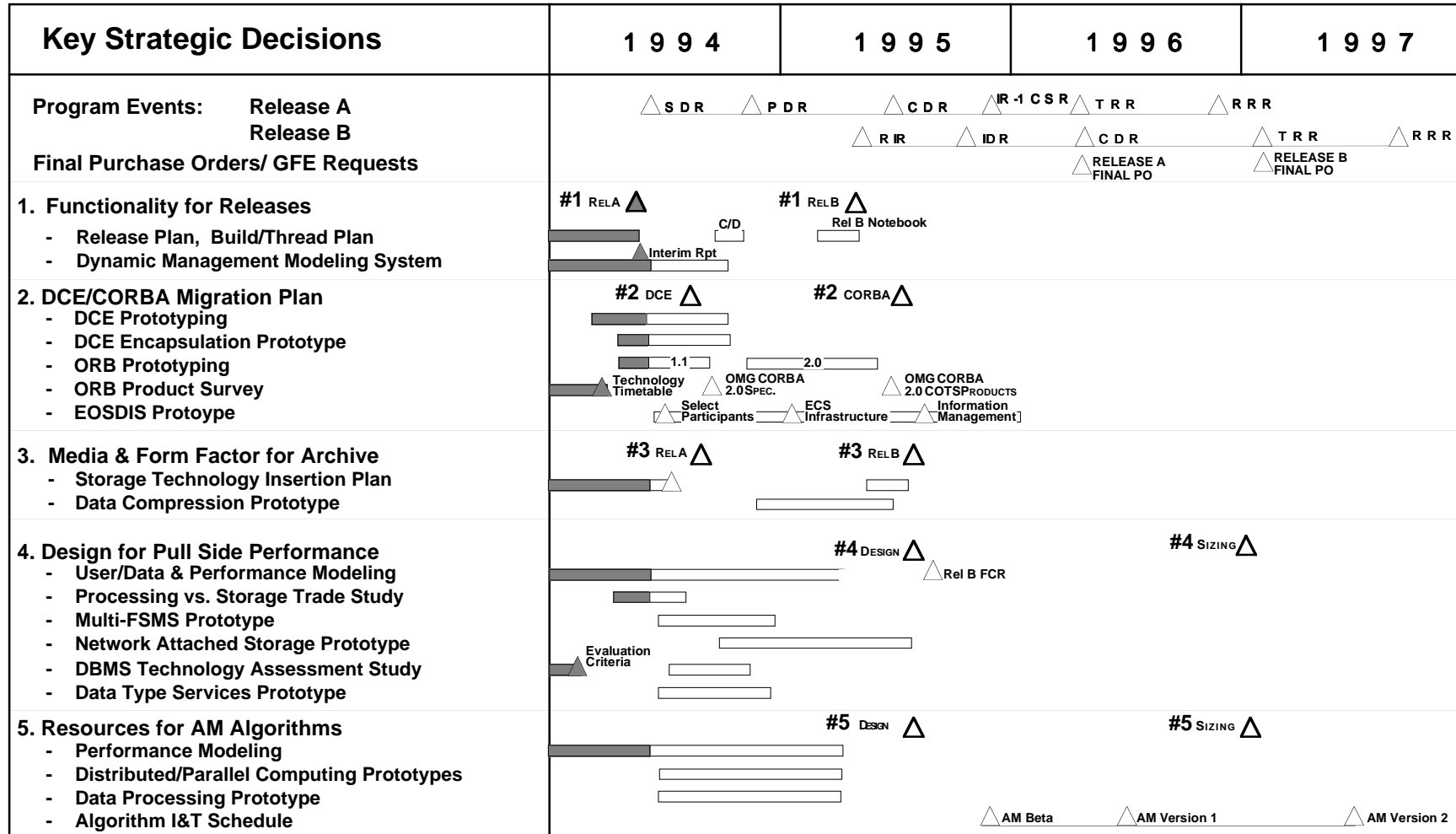
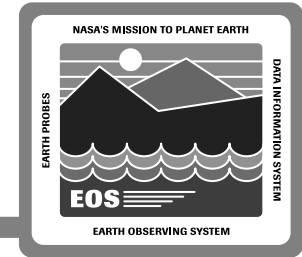
U-1 Number and Activity of Users

U-4 Processing & Storage for Standard Products

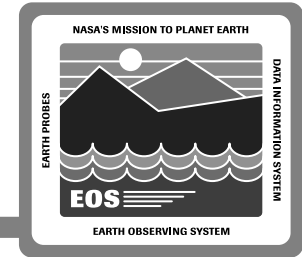
Linking Key Decisions to Program Milestones



Integrated Risk Mitigation Plan



Summary



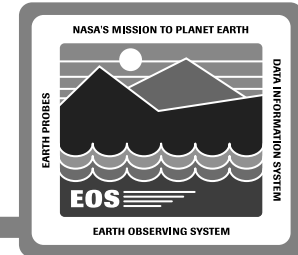
ECS Program Risk Management

- **Attention to detail with comprehensive Program Risk List**
- **Prioritized Risk List is basis for determining Strategic Decisions**
- **Strategic Decisions linked to Program Milestones**
- **Mitigation Activities support Strategic Decisions**

Continuing Activity

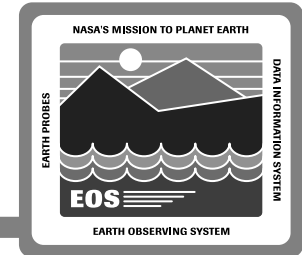
- **Risk Management Panel**
- **On-going Risk Estimation resulting in dynamic Prioritized Risk List**
- **Execution of Mitigation Activities**
- **Resolve Key Strategic Decisions**

Descriptions of Prototypes



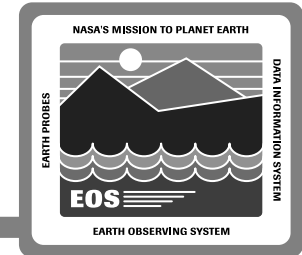
Name	Description of Prototype or Study (Organized alphabetically by first word in Name)	Related Risks	Lead Office
COTS System Management Study	Perform COTS characterizations of COTS System Management applications in order to make recommendations for implementation. Initial study complete, yearly updates to be conducted.	T-10	CSMS
Data Compression Prototype	Design trade scheduled for PDR focused on data compression. Part of the PDR trade will be to determine the impact of compression on ECS as a whole. A second part will be to determine the compression techniques most applicable to ECS data. The results of this trade will be the basis for a prototype. The prototype will test the affect of compression on the architecture using the techniques determined to be applicable to ECS data types.	T-5	SDPS
Data Processing Prototype	The overall aim is in generating a demonstration system for the processing services, and through this, providing an environment for investigation of data processing issues. The prototype identifies and utilizes freeware and custom software that may be used to generate a rapid solution to the processing system.	U-4	SDPS
Data Type Services Prototype	The focuses of this prototype will be to evaluate DBMS technology as they apply to the data types services. A technology assessment of DMSs is on-going at this time. Based on this assessment, potential DBMS products will be selected to prototype the data type services and the local information manager. Benchmark spatial search of a realistically sized inventory (~10 million records)	T-7	SDPS
DBMS Technology Assessment Study	Assess the current DBMS technology (RDBMS, OODBMS, ORDBMS) and analyze how it can be used for the architectural components. A white paper -DBMS Evaluations - has been drafted presenting the requirements for the DBMS. The white paper will be updated with product evaluation results and proposals for product prototyping	T-7	SDPS
DCE Encapsulation in CORBA APIs	Prototype encapsulation of DCE-based service (of a CORBA 1.1 subset) behind CORBA 1.1 APIs. Demonstrate CORBA type interfaces and functions for release A	T-1	CSMS
DCE Migration and Product Study	Identify or develop transition strategies form vendor specific distributed computing and management technologies to the OSF DCE/DME. Initial study complete, yearly updates to be conducted. Perform COTS characterizations for DCE/DME applications in order to make recommendations for implementation. Initial study complete, yearly updates to be conducted.	T-9	CSMS

Descriptions of Prototypes



Name	Description of Prototype or Study (Organized alphabetically by first word in Name)	Related Risks	Lead Office
DCE Prototyping	Prototype testing and evaluation of DCE for multi-cell operations, distributed file systems, and stress testing	T-9	CSMS
Distributed/Parallel Computing Science Algorithm Prototypes	This prototype will investigate possible portability problems or inefficiencies in science software not developed under this type of environment. The prototype will look at alternative ways of porting science software to and between multi-process or environments. Multi-processor environments include distributed cooperative computing with homogenous or heterogeneous clustered workstations, parallel programming on multiprocessor workstations, and parallel programming on massively parallel systems.	U-4	SDPS
Dynamic Management Modeling Study	Modeling of program cost and schedule dynamics based on extensive interviews with ECS program personnel and the rework cycle concept. Modeling is conducted by the Pugh - Roberts company.	P-3	SI&P
EOSDIS Prototype	This prototype involves extending the DCE based EP3 Infrastructure to several service providers. Three phases of the prototype have been identified: 1) selection of participants (3rd qtr 1994), 2) extension of infrastructure (4th qtr 1994) and 3) integration of value-added information management services (1st qtr 95).	T-1, U-1	SI&P
Infrastructure Prototype	Prototyping of interfaces between SDPS subsystems using the CSMS infrastructure	T-1	SDPS
Local Information Manager Prototype	A prototype of the LIM functionality will help to determine which of the several assumptions concerning the LIM architecture to use. The prototype will concentrate on providing the functionality of the LIM application rather than the schema maintenance or integration.	T-7	SDPS

Descriptions of Prototypes



Name	Description of Prototype or Study (Organized alphabetically by first word in Name)	Related Risks	Lead Office
Multi-FSMS Prototype	This prototype focuses on the interoperability and intercommunication between heterogeneous systems. Instead of concentrating on specific storage methods and capabilities, though these factors will be discussed and recorded, the investigation will be of intercommunications capabilities available from each product/host (e.g. NFS, RPCs, AFS, FRP, RCP, etc.) Emphasis will be on developing a unified, general interface layer that will present a single communications capability to external requests. The goal is to encapsulate individual heterogeneous systems in such a way that they appear to be one large, efficient system.	T-4	SDPS
Network Attached Storage Prototype	This prototype will investigate ways to implement network attached storage. Attaching the storage to the network will reduce CPU loads associated with I/O operations between subsystems such as Ingest, Processing and Archive Services. These subsystems may benefit by being able to read and write from the same RAID device attached to the network eliminating the need to transport the data from one host to another.	T-4, T-5, T-8	SDPS
ORB Product Survey	Perform COTS characterizations of COTS ORBs in order to make recommendations for implementation. Initial study complete, yearly updates to be conducted.	T-1	CSMS
ORB Prototyping	Two phases: CORBA 1.1 compliant products (now) and CORBA 2.0 compliant products as early as possible (beta versions?). Prototype CSMS services using CORBA 1.1 ORBs (to standardize application interfaces early for SDPS, FOS	T-1	CSMS
Processing vs. Storage Trade Study	Including selection of production for On Demand processing and virtual metadata trade studies.	U-1	SDPS

Note: This table provides information on prototypes and studies referenced in the Risk Management presentation for SDR. This is not a complete list of ECS Prototypes and Studies.